

Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

a 821
A 83 W 42
cap. 4

Statement by Jim Williams
Deputy Secretary of Agriculture

before the

Senate Committee on Agriculture, Nutrition and Forestry
Subcommittee on Agricultural Research and General Legislation
Honorable Donald W. Stewart, Chairman

March 11, 1980

MR. CHAIRMAN AND MEMBERS OF THE COMMITTEE:

It is a pleasure to appear before you today to discuss the Department's alternative energy program and the role of research and extension in encouraging development and implementation of alternative energy technology. We understand that you are particularly interested in how biomass energy research relates to the President's alcohol fuels program.

Although my statement centers on alcohol fuels production from agricultural products and forest residues and wastes, it sketches the overall context of the USDA's biomass energy program. This is necessary because much of our research and extension efforts are directed toward increasing the availability of woody and agricultural biomass materials--materials which are used not only to produce alcohol fuels, but also for direct combustion and to produce other forms of energy. Therefore, our alcohol fuels program is not a separate entity, but instead is an important component of the total biomass and synthetic fuels production effort.

Huge quantities of agricultural and forestry residues and wastes are generated each year along with the commercial production of agricultural and forest products. Some 500 million dry tons of wood are potentially available, but

remain unused, each year. Plant wastes such as cereal straw, corn cobs and stalks, and sugarcane bagasse total about 400 million tons of organic solids yearly. Farm animals, many of which are raised in confinement, produce another 210 million dry tons of organic matter yearly.

Total agricultural biomass from residues and wastes constitutes well over 1 billion tons of dry matter produced annually. The net energy yield from a ton of dry organic matter is roughly equal to 1.3 barrels of oil. If all residues and wastes were used, fuel equivalent in Btu value to 1.3 billion barrels of oil could be produced annually.

There are many environmental, ecological, economic and technical problems in use of farm and forest residues and wastes that will reduce the amount of residues that can be utilized for alternative fuel production, and much of the fuel produced would not be liquids. But, there is potential to produce large amounts of additional energy from agricultural and forest biomass, and much of this biomass fuel could replace current usage of oil and gas.

In addition, agricultural commodities such as corn and grain sorghum are being used to produce ethanol for gasohol. In the near term, agricultural commodities will be used more heavily than residues for alcohol fuels, because the technology is available and facilities can be expanded rapidly. Over time, however, we expect residues and new energy crops to be the major feedstocks for alcohol fuel production.

The President's gasohol program established a goal of 500 million gallons of alcohol fuel capacity to be in place in 1981. About 80 million gallons of annual on-line capacity currently exists; 420 million gallons of additional capacity is therefore necessary to reach the President's goal.

The most important action necessary at this time to achieve the President's alcohol fuels production goals is passage of the excise and income tax credits in the Oil Windfall Profits Tax Bill currently pending in Congress. We are hopeful that these vital incentives are given final approval quickly by Congress. The extension to at least 1992 of excise and income tax credits, can provide a favorable climate for firms and investors considering investments in alcohol fuel plants, since they could expect the return from the tax credits to be available for most of the amortized life of a new plant.

The USDA, through the Farmers Home Administration, has a large number of pending applications for alcohol fuel plants which can be acted upon more expeditiously once the incentives in the pending legislation are finalized.

USDA is Alcohol Fuels Effort

President Carter's goal for 1981 of 500 million gallons of ethanol is a major challenge--to increase capacity by more than six-fold in less than 2 years. This dramatic increase in ethanol production for gasohol for passenger and commercial vehicles and as direct fuel in farm power equipment will not be easy to achieve. But the USDA is committed to do its part to attain the President's program.

The Department has developed a six-point alcohol fuels effort to assist in meeting the President's goals. These are:

- Financial Assistance for Commercial-Scale Plants
- Financial Assistance for Small and Community-Scale Plants
- Management of Domestic Commodity and Other Farm Programs to Include Alcohol Production
- Research and Development
- Technical Assistance for Small-Scale Producers
- Increased Export Sales of Alcohol Byproducts

A copy of the leaflet outlining the six-point effort is attached for your information.

On February 6, I addressed the Senate Committee on Agriculture, Nutrition and Forestry and discussed in considerable detail the energy program including the alcohol fuels initiatives of USDA. This statement was published in the Committee Print, "Materials Relating to the Agricultural, Forestry, and Rural Energy Act of 1979--Title II of S. 932 (The Energy Security Act)." My statement of February 22, before the House Subcommittee on Energy Development and Applications discussed in detail the six point alcohol fuels effort of the Department. I submit both of these statements to the Subcommittee.

The remainder of my testimony focuses on only two of the six points--research and development and technical assistance for small and community-scale plants. These are topics that the Committee requested we specifically address.

Research and Development

The USDA is expanding its research and development efforts in support of the production of alcohol fuels from agricultural feedstocks. This research on alcohol fuels is conducted mostly by the Science and Education Administration (SEA), Forest Service (FS), and Economics, Statistics, and Cooperatives Service (ESCS) of the Department.

Much of the research on biomass and alcohol fuels is conducted through SEA Energy Research Centers located in Peoria, Illinois and Tifton, Georgia, and at the FS Forest Products Laboratory in Madison, Wisconsin. The staff at the Peoria center is involved in screening thousands of crops for starch and sugar content, examining other biomass materials to be utilized in large-scale conversion into alcohol fuels and evaluation of large-scale conversion processes. Staff at the center at Tifton are evaluating the production, harvesting, and conversion of wood and crop biomass to alcohol and other energy forms, and using small-scale biomass energy systems on the farm. Staff at the Laboratory at Madison are examining the conversion technologies for use of wood as a source of energy and petrochemical substitutes.

The research efforts within USDA relating to alcohol fuels production include development and selection of higher production feedstocks, more efficient conversion of these feedstocks into fuel alcohol; development of technology to allow the economic use of new feedstocks; and an assessment of the impact of the alcohol fuels program on agriculture, forestry, and rural areas of the United States.

In the near term, grains and other starch and sugar crops that are readily fermentable represent significant sources of biomass feedstocks for alcohol. The present availability of such feedstocks and of the technology for their conversion to alcohol allows them to serve as a bridge to the potentially much greater renewable resources for alcohols represented by cellulosic biomass such as crop and wood residues and crops and woody materials grown specifically for energy.

Ethanol

Because the technology is well established, ethyl alcohol has been exclusively used in the blending of gasohol currently sold in the U.S. The 90 percent unleaded gasoline to 10 percent anhydrous ethanol blend can be utilized without engine modification and with no apparent damage to engines.

With inexpensive petroleum prices during previous decades, the most recent comprehensive research effort on the utilization of ethanol as a liquid motor fuel was prior to and during World War II when petroleum stocks were threatened. Therefore, additional research on ethanol production and use is needed in the near term.

One important research area is the screening of large numbers of plants which show promise for total biomass production, high yields of hydrocarbons, and the development of substitutes for petroleum products. Research efforts will also include enhancing biomass plant production through selective genetics and plant breeding. SEA and FS are primarily responsible for these activities.

The cultural and management practices associated with maximizing total production per unit area of sugar and cellulosic biomass materials are being evaluated at the Peoria agricultural energy research center. The initial emphasis will be on crops such as sweet sorghum and sweet stalk corn. These will be evaluated in greenhouse and field-plot tests to determine appropriate management practices which will produce maximum yields with differences in climate, soil, water, fertilizer, and other management practices.

Another area where additional research is essential includes a reconstitution of ration formulations to accommodate the increased production of high-protein feed supplement which results from ethanol production from corn. The new USDA report "Small Scale Fuel Alcohol Production" identifies the minimum number of various kinds of livestock required to utilize the feed byproducts from various sizes of small-scale ethanol plants. It points out problems to be solved and energy and economic savings that might be gained if byproducts were fed as wet stillage rather than dried. SEA and ESCS will examine the limits to which the stillage residue can be fed without being dried. This reduces the energy consumed during ethanol production while still providing a valuable feed supplement.

Secretary Bergland is greatly concerned about the impacts of Federal programs on the structural changes occurring in agriculture and the particular effects on the viability of the family operated farm. Therefore, the ESCS is evaluating the economic impacts of different types and levels of biomass production on the structure of agriculture and the effect on rural areas of the U.S. The primary concern is to estimate the impacts of such a program

on the land and water resources and estimate any potential changes in the structure of agriculture.

Potential areas where structural change would occur include size of farm and ownership patterns, regional shifts in areas of crop and livestock production, different combinations of enterprises, and employment shifts in agriculture and rural areas. The effect on food price increases will also be estimated.

The SEA and Soil Conservation Service are engaged in adapting existing and developing new harvesting equipment and cultural practices which will leave the desired amount of crop residue in the field; and that will chop and bale or otherwise process biomass materials. This will minimize the loss of dry matter, energy consumption, and environmental hazards while optimizing biomass harvest, transportation and storage operations.

A cooperative research effort between the USDA and Department of Energy is evaluating the fertility and tilth effects of residue removal from use in fuel production. Goals of the study are to develop a methodology for estimating the amount of a specific crop residue by particular soil types that can be removed with acceptable environmental impact on soils, water, and productivity. Attempts are also being made to provide a basis for refining the estimates of residue availability for biomass energy production.

Research is also underway at the Peoria center and by cooperating land-grant institutions under research grants from Section 1419 of the 1977 Food and Agriculture Act to enhance the fermentation and chemical conversion process.

This involves selection and evaluation of microorganisms for the ability to produce alcohol at a higher concentration, greater rate, or to function under a variety of fermentation conditions and substrate types and concentrations.

During World War II, the FS developed an improved process for making ethanol from wood. This technology was utilized in building a pilot plant in Springfield, Oregon and while it never became operational, there is renewed interest in reevaluation of the technology. This technology is currently being used in about 40 plants in the Soviet Union.

Forestry products are being utilized by a wood pulping mill located in Bellingham, Washington to produce about 4 million gallons of ethanol annually. This plant utilized waste sulfite pulp liquor as the feedstock material.

In addition to the research efforts of the USDA, the land-grant institutions have ongoing projects which are coordinated with and complement the USDA activities. A summary of these, along with a breakout of the increased USDA energy funding on biomass for FY 1980 will be provided to the Committee.

Methanol

Methanol (wood alcohol) can also be used to displace petroleum-based fuels. Although methanol production is quite desirable because of the large quantities of forestry and wood products available, production has not proven economical on a commercial basis. Methanol is also desirable because in the longer-run our immense coal resources can be utilized as a feedstock.

Prior to the widespread use of methanol as a motor fuel, a number of parts within the engines and fuel storage and supply components of most of the Nation's vehicles must be replaced with parts which will withstand the corrosive action of methanol or methanol-gasoline blended fuel.

Methanol can be produced, along with char, oils, and gas by pyrolyzing biomass materials. If biomass is to be used as a source of methanol, the most promising technology is by gasification of wood to make a producer gas. The producer gas is then made into a synthesis gas and converted to methanol. More FS and SEA research is planned to improve these processes.

Other Alcohol Activities

Forest Service and SEA laboratories have conducted extensive programs of basic research on the hydrolysis and fermentation of crop and woody materials. Chemical reactions, kinetics, and process engineering parameters have been studied for the production of alcohols, sugars, glycols and other chemicals from cellulosic biomass. With the renewed interest in chemicals from biomass, the Forest Service, Department of Energy, and the National Science Foundation jointly funded the development of a report on the "Feasibility of Using Forest Residues for Energy and Chemicals" which was published in 1976.

The long-term involvement of USDA in basic research on hydrolysis, fermentation and chemical derivatives has resulted in a large body of information that up to this time has been scattered and not completely reported in the literature. The results of this Federal research are now being summarized and collated into a ready reference for researchers in the field.

Similarly, the FS plans to summarize, collate for ready retrieval, and keep current, research information on producing alcohol from wood at such locations as Auburn University, University of Arkansas, Dartmouth, Natick Laboratories, General Electric, University of Pennsylvania, Georgia Tech, Purdue, New York University, North Carolina State, and the University of California.

There is a potential for joint efforts with other countries in pursuing production of alcohol from biomass to mutual advantage. Much work on alcohol production has been completed in Brazil and they are on the verge of undertaking new projects for both ethanol and methanol production from eucalyptus wood. We may benefit from their experience by working more closely with them. By the same token, the Austrians and Swiss are working with the Brazilians to pilot test production of alcohol in a full-scale plant in Switzerland which was built during World War II, deactivated in 1965, and reactivated recently. We need to follow such developments.

The Forest Service Madison laboratory is conducting studies on the prehydrolysis of wood with steam to extract pentosans prior to further processing. These chemicals may be used in the production of valuable co-products such as furfural and xylytol, or, in some cases, they may be fermented to alcohol with microorganisms. This type of pretreatment might also be beneficial in preparing the wood for production of high yields of glucose and ethanol from the wood cellulose, or in preparing the wood for pulping. The need for pulping chemicals is reduced by the pretreatment.

Wood also can be given other types of pretreatment to facilitate conversion to wood sugars. FS, SEA and land-grant institutions are investigating enzyme use to degrade lignin and make the cellulose more accessible and reactive. Organic solvents are used to dissolve and remove the lignin and high pressure steam is used to remove hemicellulose.

The Forest Service is conducting extensive studies on the production and characteristics of terpenes in pine extractives. These chemicals have a potential for use in internal combustion engine fuels. Turpentine was used in aviation-grade gasoline in Japan during World War II. Turpentine can be derived from pine wood as a co-product with alcohol and pulp.

Major segments of the USDA alcohol from biomass research programs are in the planning stage. There is a need for fundamental information on the chemistry of hydrolysis and fermentation, and also in pyrolysis and gasification. In much of the recent research on cellulose breakdown for sugars and alcohols, deficiencies in analytical procedures are evident. Therefore, SEA and FS are planning an expanded research program on improved analysis and procedures for cellulose chemical conversion.

FS will be examining ways for pulp mills to produce alcohols and chemicals in an integrated forest products utilization approach. Similarly, excess energy potential at wood processing plants, in the form of residue wood or cogenerated low pressure steam could be used for distilling alcohol from grain. Thus, rural community cooperatives might use either wood residues or crops as a source of sugar and heat for making alcohol.

The USDA and the Department of Energy have been developing a program Memorandum of Understanding which would transfer a portion of DOE's Biomass energy program to the USDA for management and operation. Some \$12.8 million of pass-through funding for FY 1980 would be involved. We will be pleased to keep the Subcommittee informed of the progress on this matter.

Technology Transfer

One way to rapidly expand alcohol fuels production from biomass is through adoption of a very active technical assistance program. SEA-Extension, the Cooperative Extension Service, and the State and Private Forestry component of the Forest Service are shifting resources to place much greater emphasis on energy related programs. Some additional funding to expand programs has come as pass-through funds from DOE. Cooperative Extension Service in some States received additional funding from State Energy Offices. In seven of the 10 States DOE-Energy Extension Service pilot program, Cooperative Extension Service operated part of the programs. In many States, CES has submitted proposals to conduct the Energy Extension Service program as it is expanded nationwide.

The energy technology transfer programs among the agencies and throughout the U.S. focus on energy conservation and the substitution of renewable for non-renewable energy sources. We are focusing today only on the renewable energy resources, especially alcohol fuels production.

The Cooperative Extension Service is stressing information transfer on alternative forms of renewable energy sources for use on farms and in

rural communities. The production and use of alcohol fuels are receiving particular emphasis because of the potential to supply motor fuel needs from local feedstocks and the creation of extra markets for agricultural products.

The Cooperative Extension Service is providing information to their county offices on the alcohol fuels program as rapidly as technical information and loan assistance information becomes available. Farmers and small businesses in rural communities are extremely interested in examining the issues and the opportunities in producing alcohol. Initial feedback from a number of States indicates that interest is more on community-based plants, rather than on individual farms, because of the advantages of maintaining quality, safety control and fewer storage problems.

Specialized training and educational materials are being developed, for Extension specialists and county agents specifically designed to assist operators of small-scale facilities in production of alcohol. For example, the USDA is distributing a new comprehensive technical manual, "Small Scale Fuel Alcohol Production" prepared specifically for financial and technical information specialists to assist farmers and community business leaders interested in small-scale ethanol production. This manual is being distributed as well to the offices of FmHA, ASCS, Farm Credit Administration and other agencies. Extension is also distributing the DOE publication "Fuel from Farms--A Guide to Small-Scale Ethanol Production," to its nearly 3,000 county Extension Offices this month. The USDA film, "Gasohol--Growing Some of Our Fuel" is being widely used in State and county meetings.

The Forest Service through its Cooperative Forestry program in the State and Private Forestry system is receiving considerable inquiries from cooperators in the production of alcohol from wood, or the use of wood as a heat source for the production of alcohol. There are four projects for alcohol production for which FS is providing technical assistance.

There are many other projects underway that utilize wood as a renewable energy source to save millions of barrels of oil yearly. State and Private Forestry specialists are assisting producers to get the projects operational.

With passage by Congress of the excise and income tax credits that will make investments in alcohol production more favorable, we anticipate a major increase in involvement by the Cooperative Extension Service working with farmers and community producers on ethanol plant design, construction, production, safety, and government regulations to help install and keep small-scale facilities operating; and by the Forest Service to assist forest industry groups in both ethanol and methanol production.

This ends my prepared statement. I will try to answer any questions that you might have.

U.S.D.A.
NAT'L AGRIC LIBRARY
RECEIVED

MAY 23 '80

PROCUREMENT SECTION
CURRENT SERIAL RECORDS